Designation: D 5429 – 04

Standard Practice for Pretreatment of Backing Fabrics Used in Textile Conservation Research[1]

This standard is issued under the fixed designation D 5429; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the washing, rinsing, drying, ironing, and related testing of backing fabrics prior to their use in textile conservation research. Both sturdy and delicate pretreatment procedures for backing fabrics are described.

1.2 This practice applies only to the pretreatment of the backing fabrics with which a textile artifact might be in contact. This practice is not to be applied to any textile artifact, whether it be fragile, sturdy, historic, or contemporary, as other considerations and treatments would be required. Decisions regarding the conservation treatment of textile artifacts should be made only by textile conservators.

1.3 This practice on pretreatment of backing fabrics used in textile conservation research is limited to use on greige goods. Considerations for dyed or bleached backing fabric will not be addressed in this practice.

1.4 The procedures in this practice concern:

1.4.1 Removal of sizings and any impurities left in the backing fabric from the manufacturing process,

1.4.2 Preshrinking of the backing fabric, and

1.4.3 Testing for impurities.

1.5 All backing fabrics used in textile conservation research should be pretreated before use. Even greige fabrics obtained as "preshrunk" and "desized" should be pretreated to further reduce shrinkage and residual amounts of sizing and impurities. Residual shrinkage and impurities might be a source of unwanted variables in research.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 123 Terminology Relating to Textiles

D 2960 Method of Controlled Laundering Test Using Naturally Soiled Fabrics and Household Appliances

D 5038 Terminology of Textile Conservation

2.2 *AATCC Test Method:*

AATCC Test Method 81 Determination of pH of the Water-Extract from Bleached Textiles[3]

2.3 *Other Document:*

Spot Tests for Identification of Warp Sizes on Fabrics[4]

3. Terminology

3.1 For all terminology related to textile conservation, see Terminology D 5038.

3.1.1 The following textile conservation terms are relevant to this standard; conservation and conservator.

3.2 For definitions of other textile terms that appear in this practice, refer to Terminology D 123. For definitions of conservation terms used in this practice refer to Terminology D 5038.

4. Significance and Use

4.1 This practice applies only to the pretreatment of the backing fabric by washing, rinsing, drying, and ironing before the backing fabric will be used in textile conservation research. Textile artifacts of historic and artistic value must not be treated using this practice. Decisions regarding the conservation treatment of textile artifacts should be made only by textile conservators.

---

[1] This practice is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.53 on Consumer Textiles and Textile Conservation.

Current edition approved June 1, 2004. Published June 2004.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards*volume information, refer to the standrd's Document Summary page on the ASTM website.

[3] AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research triangle Park, NC 27709.

[4] Livengood, C. D., "Spot Tests for Identification of Warp Sizes on Fabrics, *Textile Industries*, September 1983, pp. 114-115.

4.2 This practice describes two procedures: sturdy and delicate pretreatments. Considerations of fiber content, yarn construction, and fabric construction will affect which procedure is chosen.

4.3 This practice provides for both the preshrinkage of backing fabrics used in textile conservation research and the removal of impurities such as water soluble sizings and other soils. Even backing fabrics obtained as "preshrunk" and "desized" should be pretreated to further reduce any residual amounts of sizing and shrinkage. Residual shrinkage and impurities might provide a source of unwanted variabiles in research. Not all sizings currently in use are water soluble, and some still might remain on the fabric even after pretreatment.

4.4 This practice is designed so that potentially harmful impurities, such as detergent residues, will not be added to backing fabric. Added impurities might eventually be a source of unwanted variables.

4.5 This practice is designed to essentially neutralize the pH of backing fabrics used in textile conservation research.

5. Apparatus and Materials

5.1 *Washing Machine*, either top or front loading, having water temperature and time controls and used for the sturdy pretreatment procedure.

5.2 *Sink*, a wash basin having a clean, smooth, and chemically inactive surface, used during the delicate pretreatment procedure. Other suitable containers allowing gentle, hand agitation may be used.

5.3 *Tumble Dryer*, with time and temperature controls used during sturdy pretreatment procedure.

5.4 *Flat Surface*, such as glass or plastic countertop, having a clean, smooth, and chemically inactive flat area; necessary for air drying during delicate pretreatment procedure and may be used during sturdy pretreatment procedure; aids in blocking grainlines and obtaining a smoother fabric.

5.4.1 A clothesline or rack of clean, smooth, and chemically inactive materials may be substituted for the flat surface for air drying.

5.5 *Ironing Board or Surface*, covered with a clean, desized, white, cotton fabric.

5.6 *Iron*, with a temperature control and clean sole plate.

5.6.1 Irons may contaminate textiles if they spit, drip or have soiled sole plates, so a pressing cloth should be used. Avoid using steam with the iron: instead dampen the pressing cloth or the backing fabric itself, using distilled or deionized water. Avoid using steamers to which sodium chloride or chemicals are added.

5.7 *Pressing Cloth*, medium-weight, clean, white, unsized cotton fabric that is left dry or dampened with deionized or distilled water to supply moisture; used to protect backing fabric from the iron.

5.7.1 The pressing cloth must be laundered with the specified detergent described in 5.8.

5.8 *Liquid Detergent*, formulated washing compound that contains anionic and nonionic surfactants and a soil suspending agent.[5]

5.8.1 A surfactant alone, although sometimes used by conservators to remove soil from a textile artifact being conserved, cannot effectively remove sizing from contemporary backing fabrics.

5.8.2 Undesirable ingredients in laundry detergents that must be avoided include carbonate builder, more than 2.5 % soap, fabric softener (cationic surfactant), enzyme, perfume or other additives which might not rinse out completely. Currently, most powdered detergents contain carbonate builders and should be avoided. Carbonate builders and soaps form precipitates with the dissolved minerals in hard water, leaving a white powder or scum that is difficult to rinse away completely.

5.8.3 A detergent concentration at least as high as that recommended by the manufacturer is necessary to achieve the critical micelle concentration of the surfactant so that cleaning may occur. Using too little detergent will mean ineffective starch and soil removal; however, using excessive detergent will lead to rinsing problems with incomplete removal of detergent.

5.9 *Water*, obtained from the tap for washing and rinsing. If tap water contains medium to high levels of calcium and magnesium (see 3.1.5.1), manganese, iron, or chlorine compounds, purification is desirable, especially for the final rinse. Systems that provide purified water include deionization, distillation, ion exchange, and reverse osmosis.

5.10 *pH Paper, universal pH Indicator Solution Test Kit or pH Meter*, sensitive from pH 4 to 10, ± 0.5 pH, available from a chemical supply house.[6]

5.11 *Screen*, fine-mesh screening of chemically inactive material such as nylon, or polytetrafluoroethylene (PTFE), often available at hardware stores; used to support long yardages of backing fabrics that may be weakened when wet, when removing them from wash and rinse solutions.

5.11.1 *Preparation of Screen*:

5.11.1.1 Prewash the screening to remove oils and dust.

5.11.1.2 Avoid screening with finishes and additives that could react with the pretreatment cleaning solution.

5.11.1.3 Cover all four edges of the screening with fabric binding to protect against snagging.

5.11.1.4 Never use wire screening material as corrosion or rust may be present.

---

[5] Formulations of commercially available liquid detergents frequently change. Contents of liquid detergents are listed on labels and must be read with care to avoid purchasing detergents with carbonate builders, soaps, perfumes, colorants, enzymes, or fabric softeners. The following two detergents or their equivalent have been found satisfactory for this test: (*1*) *Cheer Free* containing anionic and nonionic surfactants, water softeners, soil suspending agents, fabric whitener, water and processing aids; and (*2*) *All Free of Perfume and Clear of Dyes* containing anionic and nonionic surfactants, stabilizer buffering agent, and brightening agent.

[6] Available at chemical supply houses such as Fisher Scientific, 50 Valley Stream Parkway, Great Valley Corporate Center, Malvern, PA 19355.

5.11.1.5 Avoid use of fiberglass screens because they are coated with plasticized polyvinyl chloride, and unstable coating. Transfer of either the plasticizer or the decomposition products of aging plasticizer into the wash and rinse solutions or to adjacent backing fabrics is possible; the hydrochloric acid formed is damaging.

5.12 *Towels*, an absorbent woven or knit fabric of cotton or linen, laundered 5 times to remove softeners or sizings; used to absorb water from backing fabrics during delicate pretreatment procedure.

6. Sturdy Pretreatment Procedures for Medium- to Heavy-Weight Backing Frabrics

6.1 Use the following sturdy pretreatment for medium-to heavy-weight backing fabrics of cotton, linen, or certain manufactured fibers. The delicate pretreatment procedure (see Section 7) with shorter wash, rinse, and dry times, gentle agitation, and reduced temperatures is more appropriate for backing fabrics of delicate yarn or fabric constructions or fiber contents, such as light-weight or sheer fabrics, silk, or wools.

6.2 Complete the wash/rinse/dry cycles to remove impurities and shrink the backing fabric, then tumble dry or block after the final rinse and air dry, and iron if necessary to smooth the fabric and align the grain. Three to five wash/rinse/dry cycles are highly recommended for the sturdy pretreatment procedure, but at least one wash/rinse/dry cycle is essential. Concluding with an additional rinse is recommended.

6.3 *Sturdy Wash Cycle*:

6.3.1 Use an automatic washer to provide agitation of the backing fabric in the aqueous detergent solution, selecting the type and concentration of detergent as specified in 5.8. Use the full wash cycle time on the sturdy or regular setting with regular agitation.

6.3.2 Use hot water at 60°C (140°F) for the wash cycle to facilitate removal of impurities from the backing fabric, unless a warm temperature of 40°C (104°F) is more appropriate for the fiber content.

6.3.3 Do not overload the washing machine. If long yardages are being laundered but will be used in smaller amounts, cut the fabric into shorter lengths for effective cleaning and rinsing.

6.3.4 Use the full wash cycle time on the sturdy or regular setting with regular agitation.

6.4 *Sturdy Rinse Cycle*:

6.4.1 Use an automatic washer to provide agitation during rinsing.

6.4.2 Use warm water for rinsing to facilitate removal of detergent residues.

6.4.3 When water impurity levels are high, use purified water in the final rinse. See 5.9 for water purification systems.

6.4.4 Do not add fabric softener to any rinse cycle.

6.4.5 Additional rinses may be necessary for heavy or tightly woven fabric to remove all detergent residues and achieve a neutral pH.

6.5 *Sturdy Dry Cycle*:

6.5.1 Dry the backing fabric after each of the wash/rinse cycles to allow for maximum shrinkage.

6.5.2 Use a tumble dryer or air dry on a line, rack, or clean, smooth, chemically inactive surface such as glass or plastic countertop. Tumble drying maximizes shrinkage and more quickly achieves a dimensionally stable backing fabric.

6.5.3 Maintaining a perpendicular warp/weft alignment in the backing fabric is important. To block the fabric during the last dry cycle, drying flat on a clean countertop may be preferred. Initially selecting a fabric which is on grain (not bowed or skewed) is also important.

6.5.4 Do not use fabric softener during any drying cycle.

6.6 *Inspection*—Visually check the backing fabric to see that all soil has been removed.

6.7 *Tests for Impurities*—Test for neutral pH (see Section 8) and absence of starch (see Section 9). If achieved, continue with ironing.

6.8 *Sturdy Ironing Procedure*:

6.8.1 Caution should be used in ironing the backing fabric because of problems in obtaining a clean iron and ironing surface. If ironing is necessary to smooth wrinkles or block grainlines, use:

6.8.1.1 A dry iron with a clean sole plate,

6.8.1.2 A clean pressing cloth, dry or dampened with deionized water, and

6.8.1.3 A clean ironing surface so that no impurities are transferred to the backing fabric.

6.8.2 To aid in obtaining a smoother fabric, the backing fabric may be dampened with deionized water, rolled, and let set for 30 min prior to ironing.

6.8.3 Select the ironing temperature appropriate for the fiber content.

7. Delicate Pretreatment Procedures

7.1 The delicate pretreatment procedure with shorter wash time, more gentle agitation, and reduced temperatures is appropriate for backing fabrics of certain yarn or fabric constructions or fiber contents, such as lightweight or sheer fabrics, fine yarns, silks, or wools.

7.2 Complete the following wash/rinse/dry procedures to remove impurities and shrink the backing fabric. Two to three wash/rinse/dry cycles are highly recommended, but at least one is essential.

7.3 *Delicate Wash Cycle*:

7.3.1 Wash by hand in a clean sink or other appropriate container, making certain the container is smooth and chemically impervious.

7.3.2 Use a detergent during the wash cycles, with the type and concentration of detergent as specified in 5.8.

7.3.3 Use warm water at a temperature of 40°C (104°F), unless fiber content indicates another temperature is more appropriate.

7.3.4 Do not overload the washing container. If long yardages are being laundered but will be used in smaller amounts, cut the fabric into shorter lengths for effective cleaning and rinsing.

7.3.5 Gently agitate the detergent wash solution surrounding the backing fabric with an up and down movement of the hand, taking care not to misalign yarns. Continue agitation 3 to 5 min. Avoid rubbing.

7.3.6 Use a prepared screen (see 5.11) for lifting yardages of wet backing fabric from the detergent wash solution to avoid excessive strain while the fabric is wet and heavy.

7.3.7 Do not use a fabric softener in the wash, rinse, or dry cycle.

7.4 *Delicate Rinse*:

7.4.1 Rinse by hand in a large, clean sink or other container.

7.4.2 Follow the rinse conditions in 6.4.2 to 6.4.5.

7.4.3 Gently agitate the warm rinse water surrounding the backing fabric with an up and down movement of the hand, taking care not to misalign yarns. Continue agitation 2 to 3 min. Avoid rubbing. Concluding with an additional rinse is recommended.

7.4.4 Use a prepared screen for lifting large amounts of wet backing fabric from the rinse water to avoid excessive strain to fabric while wet and heavy.

7.5 *Delicate Dry*:

7.5.1 Blot the backing fabric using clean, desized towels to remove excess water.

7.5.2 Air dry after completing each wash/rinse cycle so that maximum shrinkage is achieved. Avoid stretching and pulling the fabric while wet.

7.5.3 Air dry flat on a clean, smooth, chemically inactive surface such as a glass or plastic countertop. Do not tumble dry to avoid distortion and undue heat.

7.5.4 To maintain a perpendicular alignment of warp and weft yarns in the backing fabric, block the wet fabric carefully on a flat surface after the last rinse cycle, avoiding stretching.

7.6 *Inspection*—Visually check the backing fabric to see that all soil has been removed. If achieved, continue with test for impurities.

7.7 *Tests for Impurities*—Test for neutral pH (see Section 8) and absence of sizings and starch (see Section 9). If achieved, continue with delicate pressing (see 7.8), if absolutely necessary.

7.8 *Delicate Pressing*:

7.8.1 Avoid pressing when possible so that delicate fibers and yarns are not damaged nor misaligned. Blocking during the last drying cycle usually will provide a smooth fabric, with warp and weft yarns appropriately aligned at right angles.

7.8.2 If pressing appears necessary after the last drying cycle, use:

7.8.2.1 A dry iron with a clean sole plate,

7.8.2.2 A clean, desized pressing cloth, dry or dampened with deionized water, and

7.8.2.3 A clean ironing surface so that no impurities are transferred to the backing fabric.

7.8.3 Select the pressing temperature appropriate for the fiber content.

8. Testing for pH[3]

8.1 Test the pH of the backing fabric after the fabric has been pretreated, to determine if an essentially neutral condition of pH 7 ± 1 has been achieved and the alkaline detergent has been removed.

8.2 *Apparatus and Materials*:

8.2.1 *Purified Water*, such as deionized or distilled. See 5.9.

8.2.2 *pH Meter*, universal pH indicator solution or pH paper.

8.3 Procedure for pH determination is based on AATCC Test Method 81.

8.3.1 Weigh an approximate 10-g piece of pretreated backing fabric, then cut it into small pieces.

8.3.2 Boil 250 mL of deionized or distilled water at a moderate rate in a 400-mL beaker for 10 min.

8.3.3 Immerse the fabric pieces, cover the beaker with a watch glass, and boil gently for an additional 10 min.

8.3.4 Allow the covered beaker and contents to cool to room temperature. Remove the fabric pieces, allowing all excess liquid to drip back into the water extract.

8.3.5 Determine the pH of the water extract, using either a pH meter, a universal pH indicator solution, or pH paper.

8.3.6 A reading of the water-extract in the neutral range (pH 7 ± 1) should be achieved. If the pH is too low, repeat the wash cycle with the recommended detergent, rinse, and dry; if the pH is too high, repeat the wash cycle without detergent, rinse, and dry. If the pH is still unsatisfactory, consider changing the proposed backing fabric.

8.4 Record the pH reading obtained and the pH measurement equipment used.

9. Testing for Removal of Water Soluble Sizings[4]

9.1 Test for the presence of sizings in the backing fabric after the fabric has been pretreated to determine if a noticeable amount of starch or other sizing remains.

9.2 *Solution*:

9.2.1 *Iodine Solution*—2.4 g of potassium iodide and 1.3 g of iodine, dissolved in water and diluted to 1 L, stored in a dark glass container.

9.3 The procedure for starch identification is based on "Spot Tests for Identification of Warp Sizes on Fabrics."[4]

9.3.1 On a small fabric piece taken from the pretreated backing fabric, apply one or two drops of iodine solution to the dry fabric.

9.3.2 Formation of a deep blue color indicates starch or polyvinyl alcohol (PVA) sizing. The absence of color indicates that starch and PVA sizings are not present.

9.4 Record the color or absence of color obtained from the test and whether starch and sizing were present or not.

9.5 If the test gives a blue color, indicating that starch and sizing are not satisfactorily removed, repeat the wash/rinse/dry cycle 1 or 2 more times. Repeat the sizing test procedure. If a blue color is still present, consider selecting another backing fabric.

10. Report

10.1 Details on the pretreatment of the backing fabric should be recorded as part of the research documentation.

10.2 State that the backing fabric was pretreated as directed in Practice D 5429, giving the fiber content and name of the backing fabric and details about the wash/rinse/cycles, including length and number of cycles, water temperature and level, degree of agitation, detergent used, drying and ironing procedures, equipment used, and other pertinent conditions.

10.3 State the results of the pH test and sizings test.

11. Keywords

11.1 backing fabric; textile conservation